



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/605,737	10/22/2003	Amarendra Anumakonda	19441-0012	2736
29052	7590	01/06/2006	EXAMINER	
SUTHERLAND ASBILL & BRENNAN LLP 999 PEACHTREE STREET, N.E. ATLANTA, GA 30309			WARTALOWICZ, PAUL A	
			ART UNIT	PAPER NUMBER
			1754	

DATE MAILED: 01/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/605,737	ANUMAKONDA ET AL.	
	Examiner	Art Unit	
	Paul A. Wartalowicz	1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-41 is/are pending in the application.
- 4a) Of the above claim(s) 29-41 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-41 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>11/10/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-28, drawn to a method, classified in class 423, subclass 650.
- II. Claims 29-41, drawn to an apparatus, classified in class 422, subclass 202.

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the process as claimed can be practiced by another materially different apparatus such as one without a reactor shell.

During a telephone conversation with Peter Pappas on December 16, 2005 a provisional election was made with traverse to prosecute the invention of the method, claims 1-28. Affirmation of this election must be made by applicant in replying to this Office action. Claims 29-41 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

Applicant is advised that the reply to this requirement to be complete must include an election of the invention to be examined even though the requirement be traversed (37 CFR 1.143).

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, and 5-10 rejected under 35 U.S.C. 103(a) as being unpatentable over Anumakonda et al. (U.S. 6221280) in view of Dicks (Journal of Power Sources, vol. 61, pages 113-124).

Anumakonda et al. teach a process for converting hydrocarbon fuel to hydrogen and carbon monoxide as main reaction products (col. 7, lines 40-44) comprising a catalytic structure disposed in the catalytic reaction zone comprising an oxidation catalyst supported on an open channel support (col. 8, lines 6-8) wherein the reactor has a an exterior wall (reactor shell, col. 10, lines 14-17), feeding a feed gas mixture comprising air (col.9, lines 26-28) and diesel fuel (col. 9, line 4) through the inlet wherein the feed mixture is passed through a supported catalytic structure (col. 7, lines 46-48) and partially oxidized (col. 8, lines 33-34) at a temperature of 1050 ° C to produce a gaseous mixture outlet rich in hydrogen and carbon monoxide (col. 7, lines 49-51). Anumakonda et al. fail to teach wherein the pre-reaction zone adjacent the catalytic reaction zone to maintain the temperature of the feed gas mixture below the flash point of the feed gas mixture until the feed gas mixture enters the catalytic reaction zone.

Dicks, however, teaches a process for the partial oxidation of natural gas (methane, page 113, col. 2, lines 16-20) wherein it is known in the art to pre-reform higher hydrocarbons because of hydrocarbons a propensity for carbon deposition (page 117, col. 1, lines 45-50). Dicks also teaches that pre-reform reactions are carried out at low temperatures for which carbon deposition reactions do not occur (250-500 ° C, page 117, col. 2, lines 1-7).

Therefore, it would have been obvious to one of ordinary skill in the art to provide a feed gas mixture maintained at a temperature of 250-500 ° C (below the flash point of the feed gas, page 117, col. 2, lines 1-7) in Anumakonda et al. because it is well known that higher hydrocarbons have a propensity for carbon deposition (page 117, col. 1, lines 45-50) and carbon deposition does not occur at low temperatures (250-500 ° C, page 117, col. 2, lines 1-7) as taught by Dicks in a chemically similar process of partial oxidation of hydrocarbons.

As to the limitations of a reactor shell, a pre-reaction zone, and post-reaction zone; when the prior art device is the same as a device claimed in the specification for carrying out the claimed method, it can be assumed that the device will inherently perform the claimed process. *In re King* 801 F.2d 1324, 231 USPQ 136(Fed. Cir. 1986).

Claims 2-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anumakonda et al. (U.S. 6221280) in view of Dicks (Journal of Power Sources, vol. 61, pages 113-124) and Abdulally (U.S. 5567228).

Anumakonda et al. teach a process for the partial oxidation as described in claim 1. Anumakonda et al. fail to teach wherein cooling is radiant, convective or carried out with a heat exchanger.

Abdulally teaches a method for cooling pollutants such as hydrocarbons (col. 1, lines 25-26) wherein a conventional heat exchanger arranged to be either convective or radiant (col. 1, lines 32-36) for the purpose of cooling pollutants such as hydrocarbons (col. 1, lines 25-26).

Therefore, it would have been obvious to one of ordinary skill in the art to provide a method for cooling (col. 1, lines 25-26) wherein a conventional heat exchanger arranged to be either convective or radiant is arranged (col. 1, lines 32-36) in Anumakonda et al. in order to cooling pollutants such as hydrocarbons (col. 1, lines 25-26) as taught by Abdulally.

Claims 11-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anumakonda et al. (U.S. 6221280) in view of Isogaya et al. (U.S. 4331451) and Sircar et al. (U.S. 6103143).

Anumakonda et al. teach a process for converting hydrocarbon fuel to hydrogen and carbon monoxide as main reaction products (col. 7, lines 40-44) comprising a catalytic structure disposed in the catalytic reaction zone comprising an oxidation catalyst supported on an open channel support (col. 8, lines 6-8) wherein the reactor has a an exterior wall (reactor shell, col. 10, lines 14-17), feeding a feed gas mixture comprising air (col.9, lines 26-28) and diesel fuel (col. 9, line 4) through the inlet wherein the feed mixture is passed through a supported catalytic structure (col. 7, lines 46-48) and partially oxidized (col. 8, lines 33-34) at a temperature of 1050 ° C to produce a gaseous mixture outlet rich in hydrogen and carbon monoxide (col. 7, lines 49-51). Anumakonda et al. fail to teach wherein maintaining the exit gas stream in the post-reaction zone adjacent the catalytic reaction zone at a temperature greater than about 600 ° C until the conversion of the feed gas mixture to hydrogen and carbon monoxide is substantially entirely complete.

Isogaya et al. teach a process for the partial oxidation of hydrocarbons (col. 1, lines 6-9) wherein the temperature of the exit of the catalyst bed is at least 800 ° C (col. 4, lines 47-50) for the purpose of inhibiting carbon deposition and accelerating methane decomposition (col. 4, lines 42-46).

Sircar et al. teach a process for producing hydrogen from hydrocarbons (col. 1, lines 27-32) wherein the temperature is increased toward the product end of the catalyst beds for the purpose of driving the reaction to completion (col. 13, lines 30-34).

Therefore, it would have been obvious to one of ordinary skill in the art to provide the temperature of the exit of the catalyst bed is at least 800 ° C (col. 4, lines 47-50) in Anumakonda et al. in order to inhibit carbon deposition and accelerating methane decomposition (col. 4, lines 42-46) as taught by Isogaya et al. and as is known that high temperature toward the product end of the catalyst beds drives the reaction to completion (col. 13, lines 30-34) as taught by Sircar et al.

As to the limitations of a reactor shell, a pre-reaction zone, and post-reaction zone, and a post-reaction shield; when the prior art device is the same as a device claimed in the specification for carrying out the claimed method, it can be assumed that the device will inherently perform the claimed process. *In re King* 801 F.2d 1324, 231 USPQ 136(Fed. Cir. 1986).

Claims 17-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anumakonda et al. (U.S. 6221280) in view of Dicks (Journal of Power Sources, vol. 61, pages 113-124) and Isogaya et al. (U.S. 4331451) and Sircar et al. (U.S. 6103143).

Anumakonda et al. teach a process for converting hydrocarbon fuel to hydrogen and carbon monoxide as main reaction products (col. 7, lines 40-44) comprising a catalytic structure disposed in the catalytic reaction zone comprising an oxidation catalyst supported on an open channel support (col. 8, lines 6-8) wherein the reactor has a an exterior wall (reactor shell, col. 10, lines 14-17), feeding a feed gas mixture comprising air (col.9, lines 26-28) and diesel fuel (col. 9, line 4) wherein a spray nozzle atomizer routes said diesel fuel to the catalytic reaction zone (spray nozzle atomizer introduces hydrocarbon fuel into the feed gas mixture with a fine mist, col. 9, lines 18-22) wherein a carbon to oxygen atom ratio in said feed gas mixture is from 0.5 to 1.0 (col. 9, lines 49-51) in the essential absence of water (col. 7, lines 55-56) at a rate within a range from about 0.01 ml to about 3 ml (col. 13, lines 36-38) through the inlet wherein the feed mixture is passed through a supported catalytic structure (col. 7, lines 46-48) and partially oxidized (col. 8, lines 33-34) at a temperature of 1050 ° C to produce a gaseous mixture outlet rich in hydrogen and carbon monoxide (col. 7, lines 49-51) and the contact time is not greater than 500 milliseconds (col. 13, lines 38-41) and a liquid hourly space velocity in said catalyst is 0.5 to 75 h⁻¹ (col. 11, lines 14-16). Anumakonda et al. fail to teach wherein the pre-reaction zone adjacent the catalytic reaction zone to maintain the temperature of the feed gas mixture below the flash point of the feed gas mixture until the feed gas mixture enters the catalytic reaction zone. Anumakonda et al. also fail to teach wherein maintaining the exit gas stream in the post-reaction zone adjacent the catalytic reaction zone at a temperature greater than about 600 ° C until

Art Unit: 1754

the conversion of the feed gas mixture to hydrogen and carbon monoxide is substantially entirely complete.

As to the claimed temperature of the feed gas, Dicks teaches a process for the partial oxidation of natural gas (methane, page 113, col. 2, lines 16-20) wherein it is known in the art to pre-reform higher hydrocarbons because of hydrocarbons a propensity for carbon deposition (page 117, col. 1, lines 45-50). Dicks also teaches that pre-reform reactions are carried out at low temperatures for which carbon deposition reactions do not occur (250-500 ° C, page 117, col. 2, lines 1-7).

Therefore, it would have been obvious to one of ordinary skill in the art to provide a feed gas mixture maintained at a temperature of 250-500 ° C (below the flash point of the feed gas, page 117, col. 2, lines 1-7) in Anumakonda et al. because it is well known that higher hydrocarbons have a propensity for carbon deposition (page 117, col. 1, lines 45-50) and carbon deposition does not occur at low temperatures (250-500 ° C, page 117, col. 2, lines 1-7) as taught by Dicks in a chemically similar process of partial oxidation of hydrocarbons. The combined teaching of Anumakonda et al. and Dicks (Journal of Power Sources, vol. 61, pages 113-124) reads on the limitation of preheating the heavy hydrocarbon fuel to a temperature greater than 180 ° C and less than the flash point of the feed gas mixture before or during introduction of the heavy hydrocarbon fuel.

As to the claimed temperature of the outlet of the reactor, Isogaya et al. teach a process for the partial oxidation of hydrocarbons (col. 1, lines 6-9) wherein the temperature of the exit of the catalyst bed is at least 800 ° C (col. 4, lines 47-50) for the

purpose of inhibiting carbon deposition and accelerating methane decomposition (col. 4, lines 42-46).

Sircar et al. teach a process for producing hydrogen from hydrocarbons (col. 1, lines 27-32) wherein the temperature is increased toward the product end of the catalyst beds for the purpose of driving the reaction to completion (col. 13, lines 30-34).

Therefore, it would have been obvious to one of ordinary skill in the art to provide the temperature of the exit of the catalyst bed is at least 800 ° C (col. 4, lines 47-50) in Anumakonda et al. in order to inhibit carbon deposition and accelerating methane decomposition (col. 4, lines 42-46) as taught by Isogaya et al. and as is known that high temperature toward the product end of the catalyst beds drives the reaction to completion (col. 13, lines 30-34) as taught by Sircar et al.

As to the limitations of a reactor shell, a pre-reaction zone, and post-reaction zone; when the prior art device is the same as a device claimed in the specification for carrying out the claimed method, it can be assumed that the device will inherently perform the claimed process. *In re King* 801 F.2d 1324, 231 USPQ 136(Fed. Cir. 1986).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul A. Wartalowicz whose telephone number is (571) 272-5957. The examiner can normally be reached on 8:30-6 M-Th and 8:30-5 on Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (571) 272-1358. The fax phone

Art Unit: 1754

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Paul Wartalowicz
December 22, 2005



COLLEEN P. COOKE
PRIMARY EXAMINER